

A Smart Night Vision System using Digital Image Processing Algorithms

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Abstract: *Human visual capability is highly dependent on ambient light and becomes ineffective during night-time or low-light environments. This limitation creates serious challenges in surveillance, security, defense, transportation, and safety-critical applications. Night-vision technology addresses this limitation by enhancing visual information captured in dark environments.*

The project titled "Night-Vision System" focuses on the development of a digital image processing-based solution capable of enhancing images captured under low-light or no-light conditions. The system captures images using a low-light or infrared-sensitive camera and applies a sequence of image preprocessing and enhancement techniques to improve visibility. Noise reduction, contrast enhancement, histogram equalization, and edge enhancement techniques are employed to extract meaningful visual details.

The proposed system follows a modular architecture that ensures efficient processing, real-time performance, and ease of scalability. The enhanced output is displayed for monitoring and analysis. The system offers a cost-effective alternative to traditional hardware-based night-vision devices and demonstrates the practical application of digital image processing techniques in real-world scenarios.

Keywords: Night Vision, Digital Image Processing, Image Enhancement, **Infrared Imaging**, Low-Light Vision

